TB-FMCL-LVDS
Hardware User Manual

Rev.2.03

Revision History

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Introduction

Thank you for purchasing the **TB-FMCL-LVDS** board. Before using the product, be sure to carefully read this user manual and fully understand how to correctly use the product. First read through this manual, then always keep it handy.

SAFETY PRECAUTIONS

Be sure to observe these precautions

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

- **Before using the product, read these safety precautions carefully to assure correct use.**
- **These precautions contain serious safety instructions that must be observed.**
- **After reading through this manual, be sure to always keep it handy.**

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual.
(Examples)

	Turn off the power switch.
	Do not disassemble the product.
	Do not attempt this.

Warning	
	In the event of a failure, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	If an unpleasant smell or smoking occurs, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	Do not disassemble, repair or modify the product. Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	Do not touch a cooling fan. As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
	Do not place the product on unstable locations. Otherwise, it may drop or fall, resulting in injury to persons or failure.
	If the product is dropped or damaged, do not use it as is. Otherwise, a fire or electric shock may occur.
	Do not touch the product with a metallic object. Otherwise, a fire or electric shock may occur.
	Do not place the product in dusty or humid locations or where water may splash. Otherwise, a fire or electric shock may occur.
	Do not get the product wet or touch it with a wet hand. Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	Do not touch a connector on the product (gold-plated portion). Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Caution	
	Do not use or place the product in the following locations. • Humid and dusty locations • Airless locations such as closet or bookshelf • Locations which receive oily smoke or steam • Locations exposed to direct sunlight • Locations close to heating equipment • Closed inside of a car where the temperature becomes high • Staticky locations • Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
	Do not place heavy things on the product. Otherwise, the product may be damaged.

■ Disclaimer

This product is a board intended for conversion between the Samtec FMC connector and the Hirose FX15 series connector. Tokyo Electron Device Limited assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, Tokyo Electron Device Limited assumes no responsibility for any damages caused by:

(1) Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
(2) Secondary impact arising from use of this product or its unusable state (business interruption or others)
(3) Use of this product against the instructions given in this manual.
(4) Malfunctions due to connection to other devices.

Tokyo Electron Device Limited assumes no responsibility or liability for:

(1) Erasure or corruption of data arising from use of this product.
(2) Any consequences or other abnormalities arising from use of this product, or
(3) Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

The specification of this product is subject to change without prior notice.

The product is subject to discontinuation without prior notice.

1. Related Documents and Board Accessories

Related Documents:

All documents relating to this board can be downloaded from our website. Please refer to attached paper of the products.

Board accessories:

- Twisted pair cable (straight cable)
  50 cm cable: x 1
- FMC spacer set
  M2.6 X 10 spacer (Duracon): x 2
  Screws with Duracon washer: x 4
- Jumper short-circuit socket
  Short-circuit socket: x12

2. Overview

This board is intended to be used for conversion between the Samtec FMC connector and the Hirose FX15 series connector. This board support high speed differential signal interface to Low-pin count connector of evaluation boards.

3. Features

FMC Connector:	Samtec FMC Connector (Low-Pin Count)
LVDS Connector:	Hirose FX15 Series
General-Purpose Interface:	General-purpose 2.54 mm pitch connector
Signal Switching:	A jumper switch for switching signal lines
Voltage Switching:	A jumper switch for switching voltage

	K	J	H	G	F	E	D	C	B	A
1	NC	NC	VREF_A_M2C	GND	NC	NC	PG_C2M	GND	NC	NC
2	NC	NC	PRSNT_M2C_L	CLK1_M2C_P	NC	NC	GND	DP0_C2M_P	NC	NC
3	NC	NC	GND	CLK1_M2C_N	NC	NC	GND	DP0_C2M_N	NC	NC
4	NC	NC	CLK0_M2C_P	GND	NC	NC	GBTCLK0_M2C_P	GND	NC	NC
5	NC	NC	CLK0_M2C_N	GND	NC	NC	GBTCLK0_M2C_N	GND	NC	NC
6	NC	NC	GND	LA00_P_CC	NC	NC	GND	DP0_M2C_P	NC	NC
7	NC	NC	LA02_P	LA00_N_CC	NC	NC	GND	DP0_M2C_N	NC	NC
8	NC	NC	LA02_N	GND	NC	NC	LA01_P_CC	GND	NC	NC
9	NC	NC	GND	LA03_P	NC	NC	LA01_N_CC	GND	NC	NC
10	NC	NC	LA04_P	LA03_N	NC	NC	GND	LA06_P	NC	NC
11	NC	NC	LA04_N	GND	NC	NC	LA05_P	LA06_N	NC	NC
12	NC	NC	GND	LA08_P	NC	NC	LA05_N	GND	NC	NC
13	NC	NC	LA07_P	LA08_N	NC	NC	GND	GND	NC	NC
14	NC	NC	LA07_N	GND	NC	NC	LA09_P	LA10_P	NC	NC
15	NC	NC	GND	LA12_P	NC	NC	LA09_N	LA10_N	NC	NC
16	NC	NC	LA11_P	LA12_N	NC	NC	GND	GND	NC	NC
17	NC	NC	LA11_N	GND	NC	NC	LA13_P	GND	NC	NC
18	NC	NC	GND	LA16_P	NC	NC	LA13_N	LA14_P	NC	NC
19	NC	NC	LA15_P	LA16_N	NC	NC	GND	LA14_N	NC	NC
20	NC	NC	LA15_N	GND	NC	NC	LA17_P_CC	GND	NC	NC
21	NC	NC	GND	LA20_P	NC	NC	LA17_N_CC	GND	NC	NC
22	NC	NC	LA19_P	LA20_N	NC	NC	GND	LA18_P_CC	NC	NC
23	NC	NC	LA19_N	GND	NC	NC	LA23_P	LA18_N_CC	NC	NC
24	NC	NC	GND	LA22_P	NC	NC	LA23_N	GND	NC	NC
25	NC	NC	LA21_P	LA22_N	NC	NC	GND	GND	NC	NC
26	NC	NC	LA21_N	GND	NC	NC	LA26_P	LA27_P	NC	NC
27	NC	NC	GND	LA25_P	NC	NC	LA26_N	LA27_N	NC	NC
28	NC	NC	LA24_P	LA25_N	NC	NC	GND	GND	NC	NC
29	NC	NC	LA24_N	GND	NC	NC	TCK	GND	NC	NC
30	NC	NC	GND	LA29_P	NC	NC	TDI	SCL	NC	NC
31	NC	NC	LA28_P	LA29_N	NC	NC	TDO	SDA	NC	NC
32	NC	NC	LA28_N	GND	NC	NC	3P3VAUX	GND	NC	NC
33	NC	NC	GND	LA31_P	NC	NC	TMS	GND	NC	NC
34	NC	NC	LA30_P	LA31_N	NC	NC	TRST_L	GA0	NC	NC
35	NC	NC	LA30_N	GND	NC	NC	GA1	12P0V	NC	NC
36	NC	NC	GND	LA33_P	NC	NC	3P3V	GND	NC	NC
37	NC	NC	LA32_P	LA33_N	NC	NC	GND	12P0V	NC	NC
38	NC	NC	LA32_N	GND	NC	NC	3P3V	GND	NC	NC
39	NC	NC	GND	VADJ	NC	NC	GND	3P3V	NC	NC
40	NC	NC	VADJ	GND	NC	NC	3P3V	GND	NC	NC
			LPC Connector	LPC Connector			LPC Connector	LPC Connector		

Figure3-1 FMC Connector Pin Layouts

4. Block Diagram

Figure 4-1 shows a block diagram of the TB-FMCL-LVDS board.
The FMC connector is mounted on the solder side of the board.

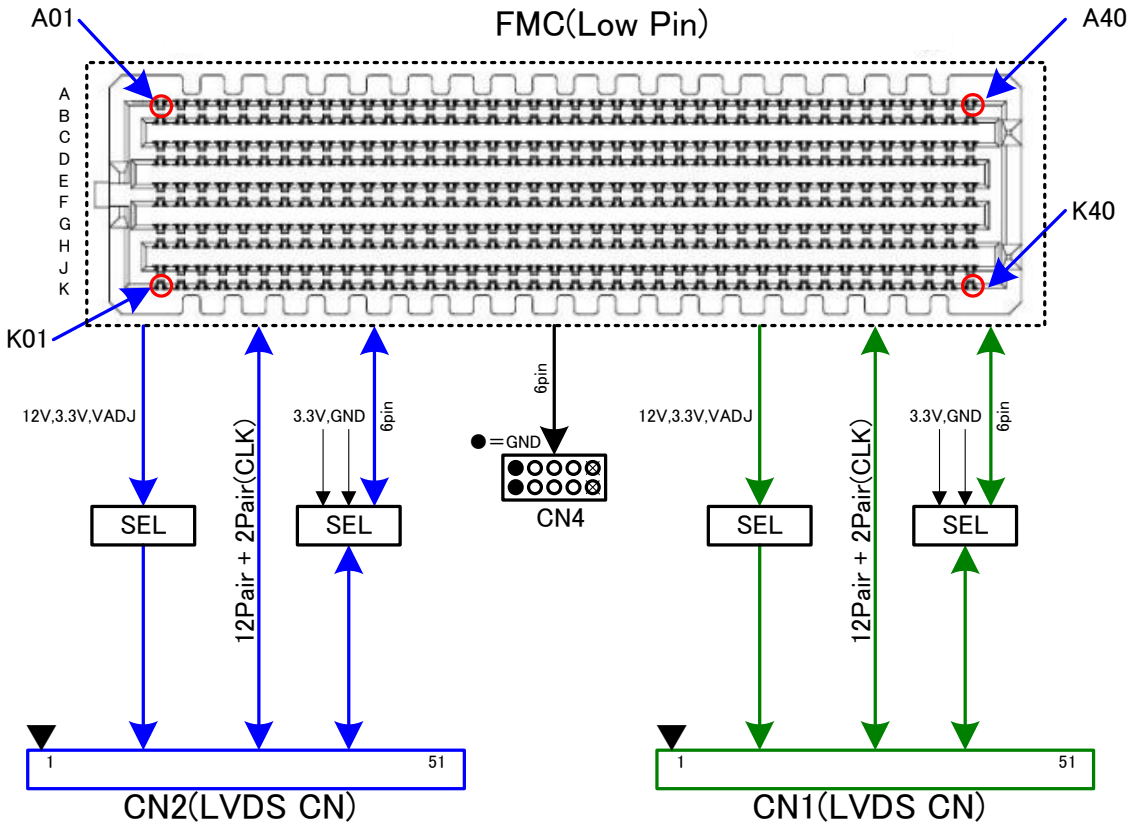

Figure4-1 Block Diagram

Main Functions:

1. 14-pair differential signal connection between FMC connector and LVDS connector (CN1,CN2)
2. Signal (FMC connector), power and GND connection to the LVDS connector (CN1,CN2)
3. Provide power to the LVDS connector
4. General-purpose signal connector (CN4) output
5. Probe points

5. External View of the Board

Figure 5-1 and 5-2 show external views of the board.

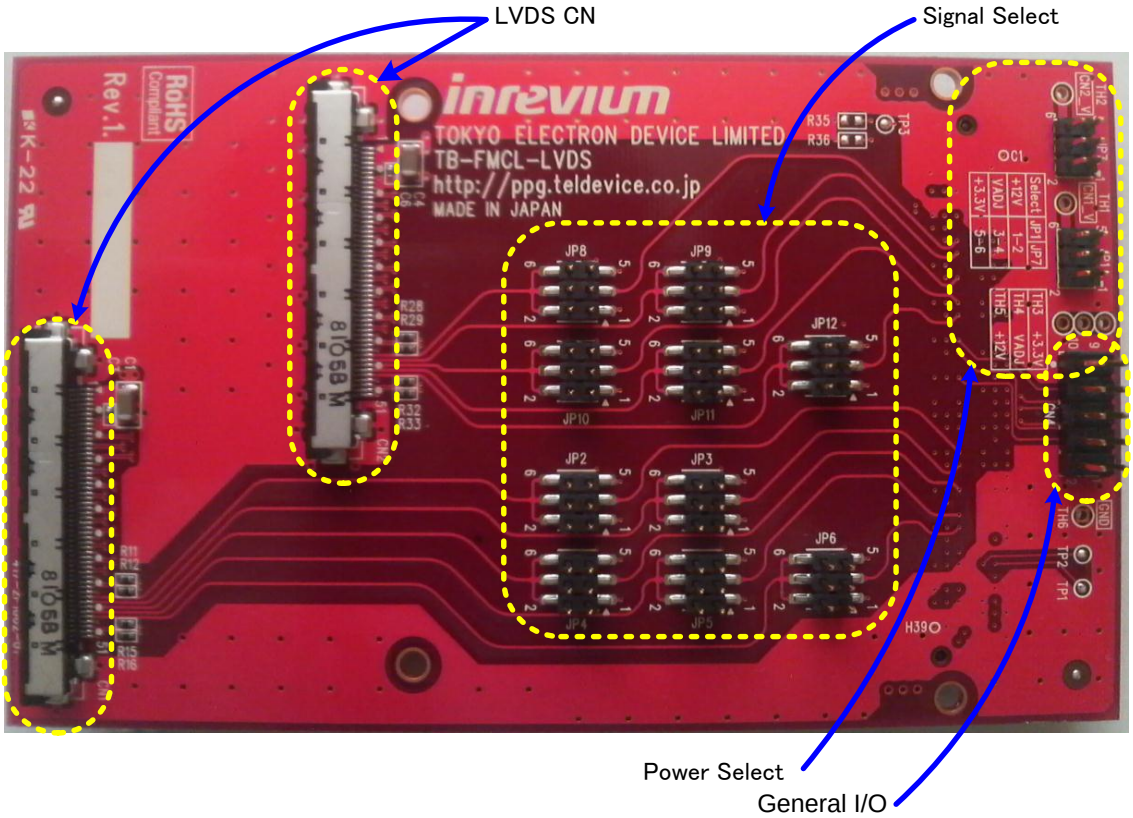

Figure5-1 Component Side

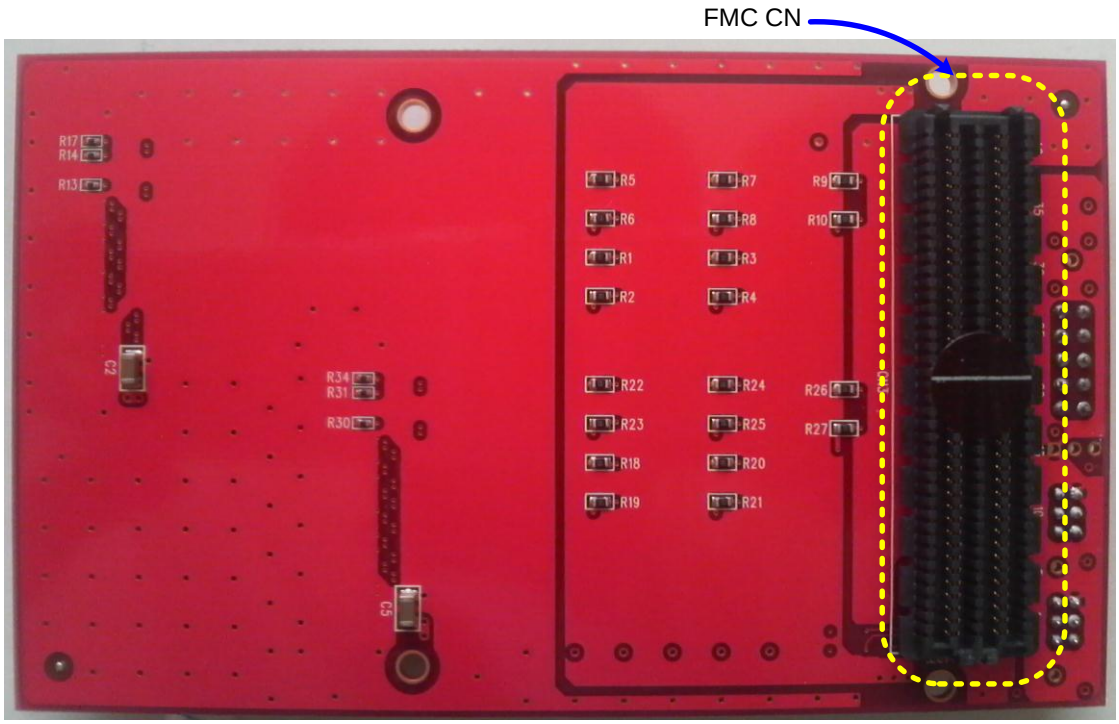

Figure5-2 Solder Side

6. Board Specification

External Dimensions:	115 mm (W) x 69 mm (H)
Layer Structure:	8-layer
Board Thickness:	1.6 mm
Material:	FR-4
FMC Connector:	Samtec ASP-134604-01
LVDS Connector:	Hirose FX15SC-51S-0.5SH
General-Purpose Interface:	Omron XG8W-1031

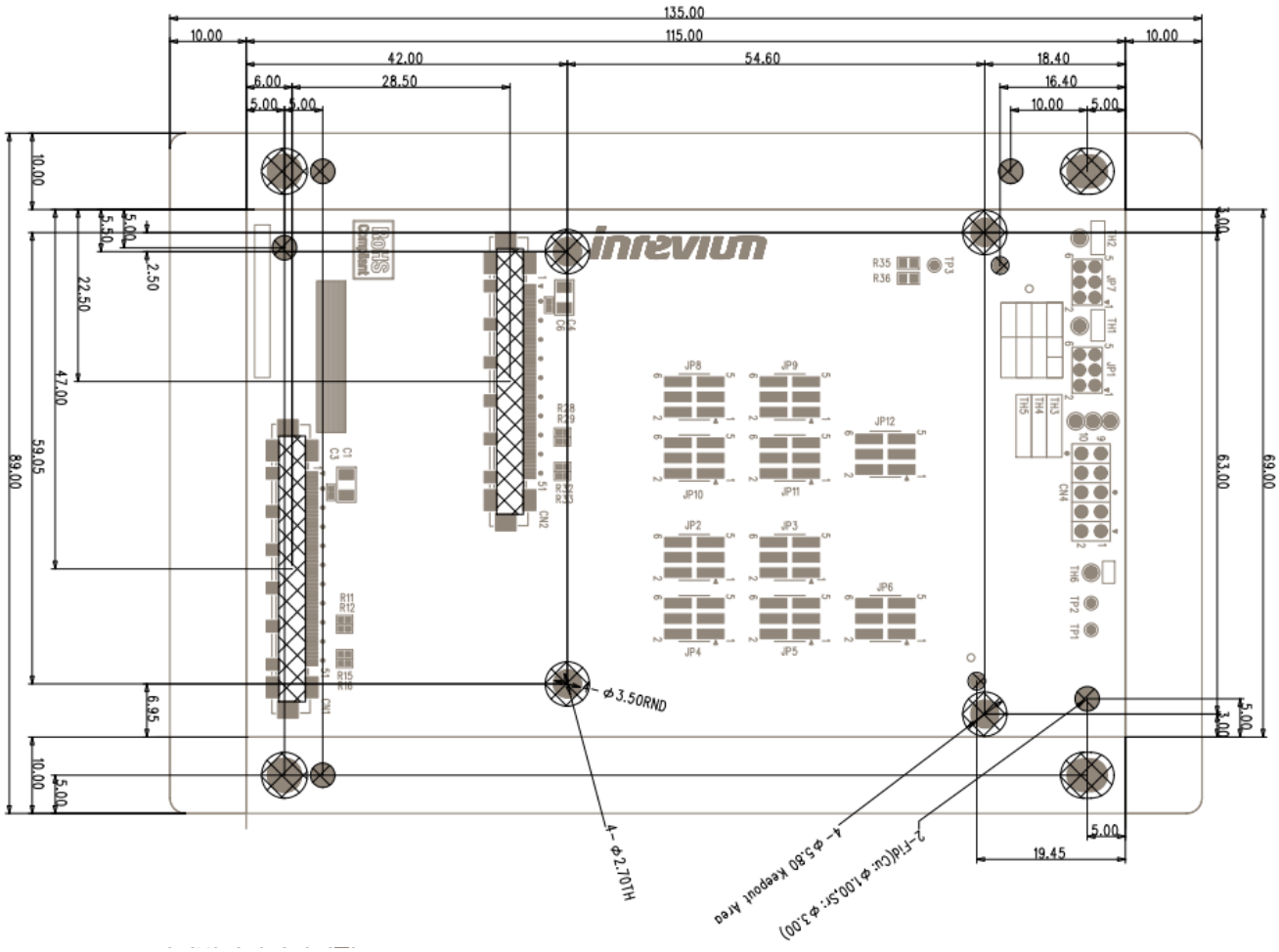

Figure6-1 Board Dimensions (inclusive of a wasteable portion)

7. Description of Each Component

7.1. Signal connection between LVDS and FMC connectors

Table 1 shows signal connection between the LVDS connector and the Samtec low-pin-count FMC connector mounted on the solder side of the board.

Table7-1 Signal Connections between LVDS (CN1) and FMC (CN3) Connectors

LVDS CN Pin No.	Signal Name	FMC CN	
		Pin No.	Pin Name
1,2,3,4,5	-	*1	-
6	Open	-	-
7,8,9,16,19,24,31,34,39	-	-	GND
42,48,51	-	*2	GND
10	A_TLA0_N	H8	LA02_N
11	A_TLA0_P	H7	LA02_P
12	A_TLB0_N	H11	LA04_N
13	A_TLB0_P	H10	LA04_P
14	A_TLC0_N	H14	LA07_N
15	A_TLC0_P	H13	LA07_P
17	A_TLCLK0_N	H5	CLK0_M2C_N
18	A_TLCLK0_P	H4	CLK0_M2C_P
20	A_TLD0_N	H17	LA11_N
21	A_TLD0_P	H16	LA11_P
22	A_TLE0_N	H20	LA15_N
23	A_TLE0_P	H19	LA15_P
25	A_TLA1_N	H23	LA19_N
26	A_TLA1_P	H22	LA19_P
27	A_TLB1_N	H26	LA21_N
28	A_TLB1_P	H25	LA21_P
29	A_TLC1_N	H29	LA24_N
30	A_TLC1_P	H28	LA24_P
32	A_TLCLK1_N	H32	LA28_N
33	A_TLCLK1_P	H31	LA28_P
35	A_TLD1_N	H35	LA30_N
36	A_TLD1_P	H34	LA30_P
37	A_TLE1_N	H38	LA32_N
38	A_TLE1_P	H37	LA32_P
40	A_TLF0_N	G34 *3	LA31_N
41	A_TLF0_P	G33 *3	LA31_P
43	A_OP0	*4	-
44	A_OP1	*4	-
45	A_OP2	*4	-
46	A_OP3	*4	-
47	A_OP4	*4	-
49	A_TLF1_N	G37 *3	LA33_N
50	A_TLF1_P	G36 *3	LA33_P

*1 JP1 is used to select either 12V, 3.3V or VADJ.
For details, see **Providing power to the LVDS connector** in section 7.2.

*2 These signal lines are connected to GND using zero-ohm resistors
For details, see **Signal lines connected to the LVDS connector via resistors** in section 7.3

*3 These signal lines are connected to the connector using zero-ohm resisters.
For details, see **Signal lines connected to the LVDS connector via resistors** in section 7.3

*4 JP2 through JP6 are used to change the destinations to be connected.
For details, see **Switching signals between FMC and LVDS connectors** in section 7.4.

Table7-2 Signal connections between LVDS (CN2) and FMC (CN3) connectors

LVDS CN Pin No.	Signal Name	FMC CN	
		Pin No.	Pin Name
1,2,3,4,5	-	*1	-
6	Open	-	-
7,8,9,16,19,24,31,34,39	-	-	GND
42,48,51	-	*2	GND
10	B_TLA0_N	D9	LA01_N_CC
11	B_TLA0_P	D8	LA01_P_CC
12	B_TLB0_N	C11	LA06_N
13	B_TLB0_P	C10	LA06_P
14	B_TLC0_N	D12	LA05_N
15	B_TLC0_P	D11	LA05_P
17	B_TLCLK0_N	G3	CLK1_M2C_N
18	B_TLCLK0_P	G2	CLK1_M2C_P
20	B_TLD0_N	G7	LA00_N_CC
21	B_TLD0_P	G6	LA00_P_CC
22	B_TLE0_N	D15	LA09_N
23	B_TLE0_P	D14	LA09_P
25	B_TLA1_N	C15	LA10_N
26	B_TLA1_P	C14	LA10_P
27	B_TLB1_N	D18	LA13_N
28	B_TLB1_P	D17	LA13_P
29	B_TLC1_N	C19	LA14_N
30	B_TLC1_P	C18	LA14_P
32	B_TLCLK1_N	D21	LA17_N_CC
33	B_TLCLK1_P	D20	LA17_P_CC
35	B_TLD1_N	C23	LA18_N_CC
36	B_TLD1_P	C22	LA18_P_CC
37	B_TLE1_N	D24	LA23_N
38	B_TLE1_P	D23	LA23_P
40	B_TLF0_N	D27 *3	LA26_N
41	B_TLF0_P	D26 *3	LA26_P
43	B_OP0	*4	-
44	B_OP1	*4	-
45	B_OP2	*4	-

LVDS CN Pin No.	Signal Name	FMC CN	
		Pin No.	Pin Name
46	B_OP3	*4	-
47	B_OP4	*4	-
49	B_TLF1_N	C27 *3	LA27_N
50	B_TLF1_P	C26 *3	LA27_P

*1 JP7 is used to select either 12V, 3.3V or VADJ.
For details, see **Providing power to the LVDS connector** in section 7.2.

*2 These signal lines are connected to GND using zero-ohm resistors
For details, see **Signal lines connected to the LVDS connector via resistors** in section 7.3

*3 These signal lines are connected to the connector using zero-ohm resisters.
For details, see **Signal lines connected to the LVDS connector via resistors** in section 7.3

*4 JP8 through JP12 are used to change the destinations to be connected.
For details, see **Switching signals between FMC and LVDS connectors** in section 7.4.

7.2. Providing power to the LVDS connector

Power can be provided to the LVDS connector by selecting 12V, 3.3V or VADJ that is supplied from the FMC connector. The selected supply voltage can be monitored at the test points TH1 and TH2. The structure of voltage selection is shown in Figure 7-1 and voltage selection method in Table 3.

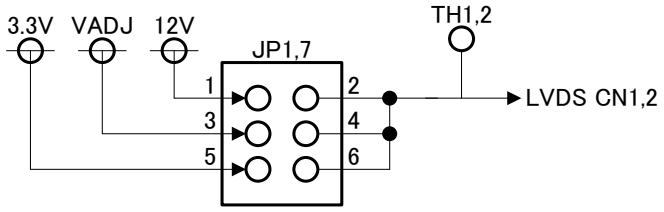

Figure7-1 A Structure of Voltage Selection

Table7-3 Voltage Selection

CN: Pin No.	JP	Connect			Test Point
		1-2	3-4	5-6	
CN1: 1,2,3,4,5	JP1	12V	VADJ	3.3V	TH1
CN2: 1,2,3,4,5	JP7	12V	VADJ	3.3V	TH2

7.3. Signals lines connected to the LVDS connector via resistors

Figure 7-2 shows a circuit of LVDS connector. Some signals and ground connect to the LVDS connector via resistors. These resistors are mounted at shipment. To disconnect any of the signal lines, remove the associated resistors from the lines.

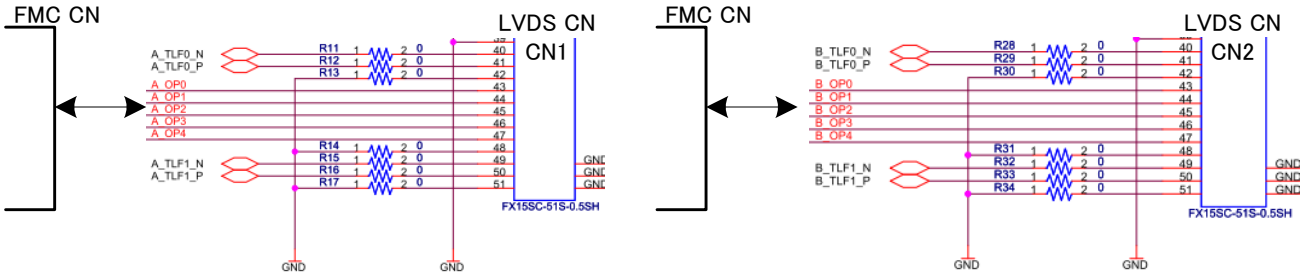

Figure7-2 Structure for Signal Line Control

Table7-4 Mapping Table for Signal Line Control

CN No.	LVDS CN Pin No.	Resistor #	Connect
CN1	40 (A_TLF0_N)	R11	FMC G34 (LA31_N)
	41 (A_TLF0_P)	R12	FMC G33 (LA31_P)
	42	R13	GND
	48	R14	GND
	49 (A_TLF1_N)	R15	FMC G37 (LA33_N)
	50 (A_TLF1_P)	R16	FMC G36 (LA33_P)
	51	R17	GND
CN2	40 (B_TLF0_N)	R28	FMC D27 (LA26_N)
	41 (B_TLF0_P)	R29	FMC D26 (LA26_P)
	42	R30	GND
	48	R31	GND
	49 (B_TLF1_N)	R32	FMC C27 (LA27_N)
	50 (B_TLF1_P)	R33	FMC C26 (LA27_P)
	51	R34	GND

7.4. Signal switching between FMC and LVDS Connectors

Figure 7-3 shows a structure for switching signals between FMC and LVDS connectors. Table 5 provides a mapping table for signal switching.

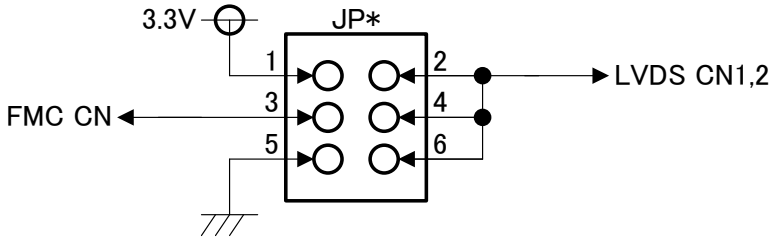

Figure7-3 Structure for Signal Switching

Table7-5 Mapping Table for Signal Switching

LVDS CN	JP	Connect		
		1-2	3-4	5-6
CN1 43(A_OP0)	JP2	3.3V	FMC G25(LA22_N)	GND
CN1 44(A_OP1)	JP3	3.3V	FMC G27(LA25_P)	GND
CN1 45(A_OP2)	JP4	3.3V	FMC G28(LA25_N)	GND
CN1 46(A_OP3)	JP5	3.3V	FMC G30(LA29_P)	GND
CN1 47(A_OP4)	JP6	3.3V	FMC G31(LA29_N)	GND
CN2 43(B_OP0)	JP8	3.3V	FMC G9(LA03_P)	GND
CN2 44(B_OP1)	JP9	3.3V	FMC G10(LA03_N)	GND
CN2 45(B_OP2)	JP10	3.3V	FMC G12(LA08_P)	GND
CN2 46(B_OP3)	JP11	3.3V	FMC G13(LA08_N)	GND
CN2 47(B_OP4)	JP12	3.3V	FMC G15(LA12_P)	GND

7.5. General-Purpose Interface

The board provides an onboard 10-pin, 2.54mm pitch header (CN4), to which 6 FMC connector signal pins are connected.

Table7-6 General-Purpose Interface Pin Layout

FMC Pin No. (Name)	CN4		FMC Pin No. (Name)
	Pin No.	Pin No.	
GND	1	2	GND
G18 (LA16_P)	3	4	G19 (LA16_N)
G21 (LA20_P)	5	6	G22 (LA20_N)
G24 (LA22_P)	7	8	G16 (LA12_N)
NC	9	10	NC

7.6. FMC Connector Signal Processing

The following signal processing is implemented for the FMC connector pins.

7.6.1. Power Supply

Three different types of power (12V, 3.3V and VADJ) are provided from the FMC connector. They can be monitored at the test points (TH3 through TH5) shown in Table 7.

Table7-7 FMC Power Supply Pins

FMC Pin No.	Power	Test Point
C35,C37	12V	TH5
C39,D32,D36,D38,D40	3.3V	TH3
G39,H40	V ADJ	TH4

7.6.2. Test Points (TPs)

The board provides on-board test pads (TPs) to monitor the FMC connector pins.

Table7-8 FMC CN Signal Test Pads

FMC Pin No.		Test PAD
Pin No.	Pin Name	
C34	GA0	TP1
D35	GA1	TP2
H1	VREF_A_M2C	TP3

7.6.3. Signal Ground Processing

The board provides the structure of ground processing for the FMC connector pins. The resistors shown in Figure 7-4 are not mounted at shipment.

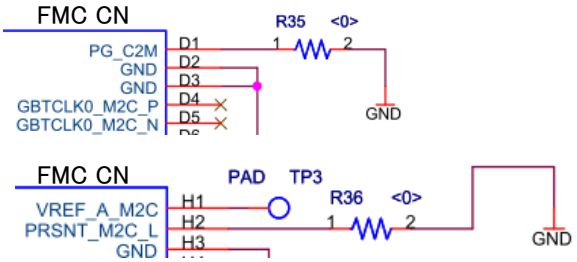

Figure7-4 Structure of FMC CN Signal Ground Processing

Table7-9 FMC CN Ground Processing

FMC Pin No.		Resistor
Pin No.	Pin Name	
D1	PG_C2M	R35
H2	PRSNT_M2C_L	R36

8. Factory-Default Switch Settings

Figure 8-1 shows the factory-default switch settings. Look at the switch settings encompassed with dotted lines.

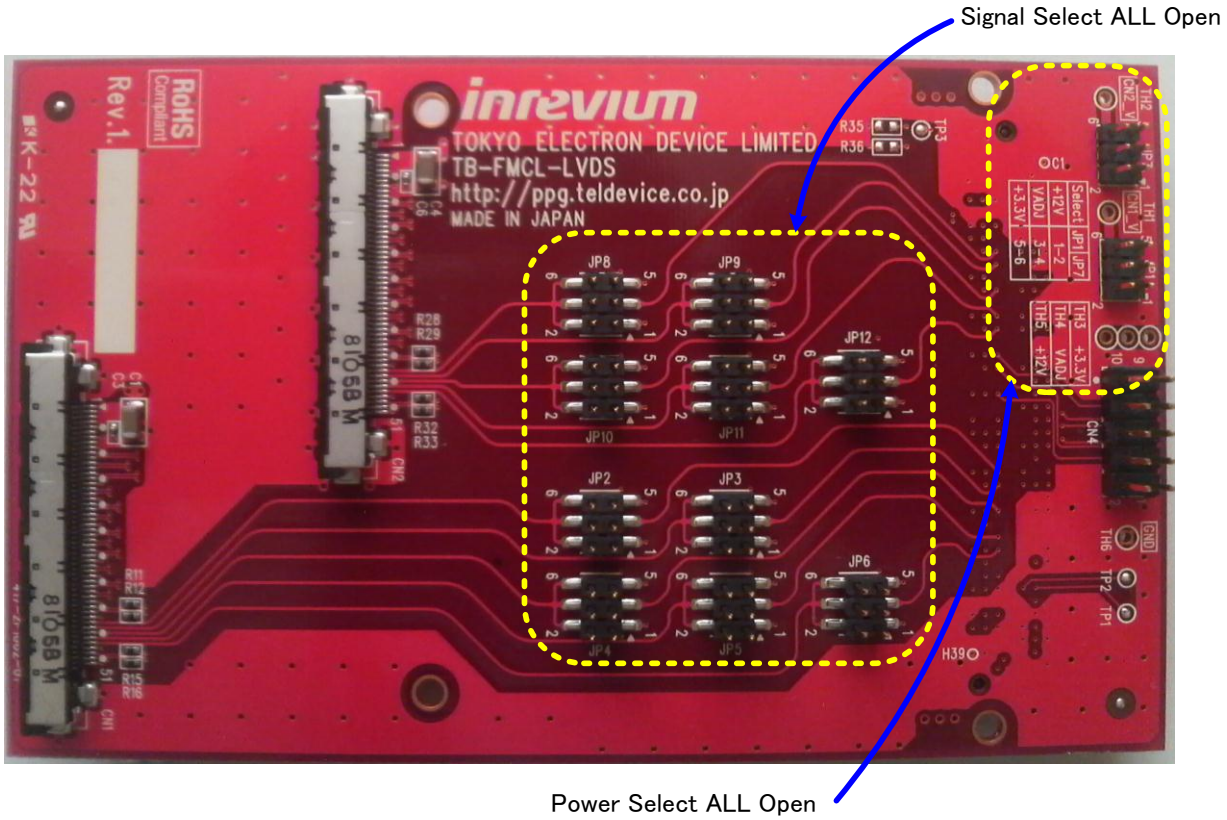

Figure8-1 Component Side

Table8-1 Factory Default Settings

No.	Silk No.	Initial Setting	Function
1	JP1	Open	Voltage selection (12V / VADJ / 3.3V)
2	JP2	Open	Signal Selection (3.3V / Signal / GND)
3	JP3	Open	Signal Selection (3.3V / Signal / GND)
4	JP4	Open	Signal Selection (3.3V / Signal / GND)
5	JP5	Open	Signal Selection (3.3V / Signal / GND)
6	JP6	Open	Signal Selection (3.3V / Signal / GND)
7	JP7	Open	Voltage selection (12V / VADJ / 3.3V)
8	JP8	Open	Signal Selection (3.3V / Signal / GND)
9	JP9	Open	Signal Selection (3.3V / Signal / GND)
10	JP10	Open	Signal Selection (3.3V / Signal / GND)
11	JP11	Open	Signal Selection (3.3V / Signal / GND)
12	JP12	Open	Signal Selection (3.3V / Signal / GND)

9. An Example of Settings

Figure 9-1 shows an example of settings when performing a loopback test within the board. Be careful about the jumper settings of the TB-6S-LX150T-IMG main board.

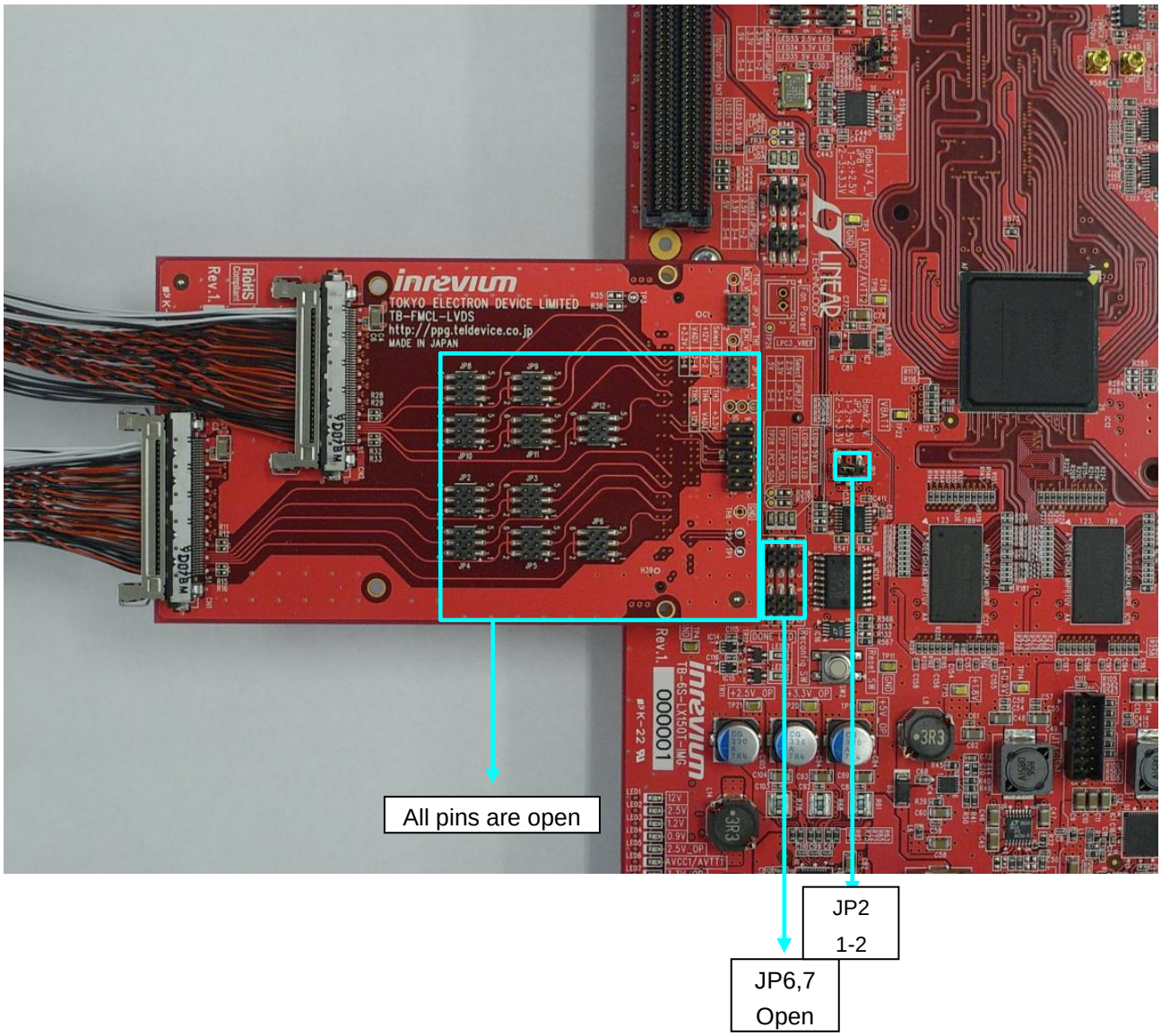

Figure9-1 Example of Settings

Table9-1 Settings in the Example

No.	Silk No.	Setting	Function
1	JP2	1-2	Bank2 voltage setting (**2.5V** / 3.3V)
2	JP6,7	Non	FMC3 VADJ voltage setting (2.5V / 3.3V / 5V / **no voltage**) (these jumper settings must be the same)

* The values indicated by boldface in the Function field show the settings in the example.

EC Declaration of Conformity

Tokyo Electron Device Limited.

We declare, under our solo responsibility, that the product:

Product: LVDS Interface FMC Board
Model: TB-FMCL-LVDS

Product: Kintex-7 FPGA Evaluation Board
Model: TB-7K-325T-IMG

To which this declaration relates complies with the provisions of following European Directives:

73/23/EEC as amended by 93/68/EEC – Directive on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
89/336/EEC as amended by 92/31/EEC and 93/68/EEC – Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.
2004/108/EC as amended by

Allied Harmonized Standards

EN 55022(2010) Class A
EN 61000-3-2(2006) + A2(2009)
EN 61000-3-3(2008)
EN 55024(2010)

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